

What is claimed is:

1 1. A Computer Aided Design apparatus for aiding a design  
2 of a printed wiring board, comprising:

3 determining means for determining a component order  
4 in an ascending order of impedance of passive components  
5 amongst components to be placed on the printed wiring  
6 board; and

7 placement means for placing the passive components  
8 in the determined component order.

1 2. A Computer Aided Design apparatus according to Claim  
2 1, wherein

3 the placement means places each of the passive  
4 components in a vicinity of a power pin of a non-passive  
5 component which is already placed.

1 3. A Computer Aided Design apparatus according to Claim  
2 2, wherein

3 the determining means determines the component order  
4 using an ascending order of equivalent series inductance  
5 of the passive components as the ascending order of  
6 impedance.

1 4. A Computer Aided Design apparatus according to Claim  
2 3, wherein the determining means comprises:  
3 table means for retaining a plurality of pin spacings  
4 of passive components and an inductance value  
5 corresponding to each pin spacing,  
6 referring means for referring to the equivalent  
7 series inductance corresponding to the pin spacing of each  
8 passive component retained in the table means; and  
9 sorting means for sorting the inductance value  
10 referred for each passive component in ascending order,  
11 and making the ascending order of inductance value the  
12 component order.

1 5. A Computer Aided Design apparatus according to Claim  
2 4, wherein  
3 the determining means determines the component order  
4 using a descending order of effective frequency spectrum  
5 as the ascending order of impedance, the effective  
6 frequency spectrum being a frequency spectrum in which the  
7 impedance of a passive component is no greater than a  
8 threshold value.

1 6. A Computer Aided Design apparatus according to Claim  
2 5, wherein the determining means comprises:

3        table means for retaining a plurality of pin spacings  
4        of passive components, and an effective frequency spectrum  
5        corresponding to each pin spacing,  
6        referring means for referring each the effective  
7        frequency spectrum corresponding to the pin spacing of each  
8        passive component retained in the table means; and  
9        sorting means for sorting the effective frequency  
10       spectrum referred for each component in descending order,  
11       and making the descending order of effective frequency  
12       spectrum the component order.

1       7. A Computer Aided Design apparatus according to Claim  
2       5, wherein the determining means comprises:

3       calculation means for calculating the effective  
4       frequency spectrum for each passive component from at least  
5       one of a capacitance and an inductance of the passive  
6       component; and

7       sorting means for sorting the effective frequency  
8       spectrum calculated for each component in descending order,  
9       and making the descending order of effective frequency  
10       spectrum the component order.

1       8. A Computer Aided Design apparatus according to Claim  
2       7 wherein

3       the calculation means calculates the effective  
4 frequency spectrum using at least the inductance of a  
5 passive component, when the passive component is one of  
6 a capacitor, a resistor, and a filter.

1   9. A Computer Aided Design apparatus according to Claim  
2   2, wherein

3       the passive components are capacitors; and  
4       the determining means determines the component order  
5 using an ascending order of the equivalent series  
6 inductance of the capacitors as the ascending order of  
7 impedance.

1   10. A Computer Aided Design apparatus according to Claim  
2   9, wherein

3       the determining means determines the component order  
4 using an ascending order of capacity of the capacitors as  
5 the ascending order of equivalent series inductance.

1   11. A Computer Aided Design apparatus according to Claim  
2   9, wherein

3       the determining means determines the component order  
4 considering an ascending order of terminal spacing of the  
5 capacitors to be the ascending order of equivalent series

6 inductance.

1 12. A Computer Aided Design apparatus according to Claim  
2 9, wherein the determining means comprises:

3 table means for retaining a plurality of pin spacings  
4 of capacitors, and an equivalent series inductance  
5 corresponding to each pin spacing,

6 referring means for referring to each the effective  
7 frequency spectrum corresponding to the pin spacing of each  
8 capacitor retained in the table means; and

9 sorting means for sorting the equivalent series  
10 inductance referred for each component in descending order,  
11 and making the sorted equivalent series inductances the  
12 component order.

1 13. A Computer Aided Design apparatus according to Claim  
2 2, wherein

3 the passive components are capacitors; and

4 the determining means determines the component order  
5 using a descending order of effective frequency spectrum,  
6 the effective frequency spectrum being a frequency  
7 spectrum in which the impedance of a capacitor is no greater  
8 than a threshold value, instead of the ascending order of  
9 impedance.

1 14. A Computer Aided Design apparatus according to Claim  
2 13, wherein the determining means comprises:

3 table means for retaining a plurality of pin spacings  
4 of capacitors, and an effective frequency spectrum  
5 corresponding to each pin spacing,

6 referring means for referring to the effective  
7 frequency spectrum corresponding to the pin spacing of each  
8 capacitor retained in the table means; and

9 sorting means for sorting the effective frequency  
10 spectrum referred for each capacitor in descending order,  
11 and making the sorted effective frequency spectrum the  
12 component order.

1 15. A Computer Aided Design apparatus according to Claim  
2 13 wherein the determining means comprises:

3 calculation means for calculating the effective  
4 frequency spectrum for each capacitor from at least one  
5 of a capacitance and an inductance of the capacitor; and

6 sorting means for sorting and the effective frequency  
7 spectrum calculated for capacitor in descending order, and  
8 making the sorted effective frequency spectrum the  
9 component order.

1 16. A Computer Aided Design apparatus according to Claim

2 1, further comprising:

3 pin order determining means for setting a pin order  
4 for each power pin of non-passive components in order of  
5 seriousness of noise that can occur in a current that flows  
6 through the power pin; and

7 assigning means for assigning each passive component  
8 to a component which has a power pin, in descending pin  
9 order and descending component order,

10 the placement means placing each passive component  
11 in a vicinity of the power pin of the component to which  
12 the passive component is assigned, in the descending order  
13 of component order.

1 17. A Computer Aided Design apparatus according to Claim  
2 16, wherein

3 the pin order determining means determines the pin  
4 order using a descending order of a signal frequency which  
5 is driven by a current which flows through the power pin,  
6 as the order of seriousness.

1 18. A Computer Aided Design apparatus according to Claim  
2 16, wherein

3 the pin order determining means determines the pin  
4 order using an order of shortness of one of a rising time

5 and a falling time of a signal which is driven by a current  
6 which flows through the power pin, instead of the order  
7 of seriousness.

1 19. A Computer Aided Design apparatus according to Claim  
2 16, wherein

3 the pin order determining means determines the pin  
4 order using an ascending order of shortness of the shorter  
5 of a rising time and a falling time of a signal which is  
6 driven by a current which flows through the power pin, as  
7 the order of seriousness.

1 20. A Computer Aided Design apparatus according to Claim  
2 16 wherein

3 the pin order determining means determines the pin  
4 order using a descending order of an amount of consumed  
5 current of a signal which is driven by a current which flows  
6 through the power pin, as the order of seriousness.

1 21. A Computer Aided Design apparatus according to Claim  
2 16, wherein

3 the pin order determining means calculates a voltage  
4 waveform of a signal which is driven by the current which  
5 flows through the power pin, based on a voltage, a frequency,



6 a rising time, a falling time, and a duty ratio of the signal.  
7 and sets the pin order using a descending order of a maximum  
8 frequency of a voltage that exceeds a voltage threshold  
9 in the voltage waveform, as the order of seriousness.

1 22. A Computer Aided Design apparatus according to Claim  
2 16, wherein

3 the pin order setting means determines the pin  
4 priority order of power pins connected to a net, for each  
5 net, and

6 the assigning means assigns components to be  
7 connected to a net to one net.

1 23. A Computer Aided Design apparatus for a printed wiring  
2 board for placing a component belonging to a second type  
3 of components in a vicinity of a component belonging to  
4 a first type of components, comprising:

5 first determining means for determining a pin order  
6 in order of seriousness of noise that can occur in a current  
7 that flows through a power pin, for a power pin of each  
8 of the components belonging to the first type of  
9 components,

10 second determining means for determining a component  
11 order in ascending order of impedance for each component

12 belonging to the second type of components; and  
13 assigning means for assigning a second type component  
14 which is highest amongst the components in the component  
15 order that are not assigned, to a first type component  
16 having a power pin which is highest amongst the power pins  
17 in the pin priority that are not assigned.

1 24. A Computer Aided Design apparatus according to Claim  
2 23, wherein

3 the first type of components includes active  
4 components, and the second type of components is passive  
5 components.

1 25. A Computer Aided Design apparatus according to Claim  
2 23, further comprising:

3 placement means for placing each second type  
4 component in a vicinity of a first type component having  
5 the power pin to which the second type component is assigned,  
6 in the component order.

1 26. A Computer Aided Design apparatus according to Claim  
2 25, wherein

3 the first determining means determines the pin order  
4 using a descending order of a signal frequency which is

5 driven by a current which flows through the power pin, as  
6 the order of seriousness.

1 27. A Computer Aided Design apparatus according to Claim  
2 26 wherein

3 the second determining means determines the  
4 component order using an ascending order of equivalent  
5 series inductance of the passive components as the  
6 ascending order of impedance.

1 28. A Computer Aided Design apparatus according to Claim  
2 27, wherein the first determining means comprises:

3 table means for retaining a plurality of pin spacings  
4 of passive components and an inductance value  
5 corresponding to each pin spacing,

6 referring means for referring to the effective  
7 frequency spectrum corresponding to the pin spacing of each  
8 passive component retained in the table means, and

9 sorting means for sorting the inductance value  
10 referred for each passive component in ascending order,  
11 and making the ascending order of inductance value the  
12 component order.

1 29. A Computer Aided Design apparatus according to Claim

2 26, wherein

3       the second determining means determines the  
4 component order using a descending order of effective  
5 frequency spectrum as the ascending order of impedance,  
6 the effective frequency spectrum being a frequency  
7 spectrum in which the impedance of a passive component is  
8 no greater than a threshold value.

1 30. A Computer Aided Design apparatus according to Claim  
2 26, wherein the second determining means comprises:

3       table means for retaining a plurality of pin spacings  
4 of passive components, and an effective frequency spectrum  
5 corresponding to each pin spacing,

6       referring means for referring to the equivalent  
7 series inductance corresponding to the pin spacing of each  
8 passive component retained in the table means; and

9       sorting means for sorting the effective frequency  
10 spectrum referred for each component in descending order,  
11 and making the descending order of effective frequency  
12 spectrum the component order.

1 31. A Computer Aided Design apparatus according to Claim  
2 29, wherein the second determining means comprises:

3       calculation means for calculating the effective

4 frequency spectrum for each passive component from at least  
5 one of a capacitance and an inductance of the passive  
6 component; and

7 sorting means for sorting the effective frequency  
8 spectrum calculated for each component in descending order,  
9 and making the descending order of effective frequency  
10 spectrum the component order.

1 32. A Computer Aided Design apparatus according to Claim  
2 26, wherein

3 the passive components are capacitors, and  
4 the second determining means determines the  
5 component order using an ascending order of the equivalent  
6 series inductance of the capacitors as the ascending order  
7 of impedance.

1 33. A Computer Aided Design apparatus according to Claim  
2 32, wherein

3 the second determining means determines the  
4 component order using an ascending order of capacity of  
5 the capacitors as the ascending order of equivalent series  
6 inductance.

1 34. A Computer Aided design apparatus according to Claim

2 32, wherein

3 the second determining means determines the  
4 component order considering an ascending order of terminal  
5 spacing of the capacitors to be the ascending order of  
6 equivalent series inductance.

1 35. A Computer Aided Design apparatus according to Claim  
2 32, wherein the second determining means comprises:

3 table means for retaining a plurality of pin spacings  
4 of capacitors, and an equivalent series inductance  
5 corresponding to each pin spacing,

6 referring means for referring to the equivalent  
7 series inductance corresponding to the pin spacing of each  
8 capacitor retained in the table means; and

9 sorting means for sorting the equivalent series  
10 inductance referred for each component in descending order,  
11 and making the sorted equivalent series inductances the  
12 component order.

1 36. A Computer Aided Design apparatus according to Claim  
2 26, wherein

3 the passive components are capacitors, and

4 the determining means determines the component order  
5 using a descending order of effective frequency spectrum,

6 the effective frequency spectrum being a frequency  
7 spectrum in which the impedance of a capacitor is no greater  
8 than a threshold value, instead of the ascending order of  
9 impedance.

1 37. A Computer Aided Design apparatus according to Claim  
2 36, wherein the second determining means comprises:

3 table means for retaining a plurality of pin spacings  
4 of capacitors, and an effective frequency spectrum  
5 corresponding to each pin spacing,

6 referring means for referring to the effective  
7 frequency spectrum corresponding to the pin spacing of each  
8 capacitor retained in the table means; and

9 sorting means for sorting the effective frequency  
10 spectrum referred for each capacitor in descending order,  
11 and making the sorted effective frequency spectrum the  
12 component order.

1 38. A Computer Aided Design apparatus according to Claim  
2 36, wherein the second determining means comprises:

3 calculation means for calculating the effective  
4 frequency spectrum for each capacitor from at least one  
5 of a capacitance and an inductance of the capacitor; and

6 sorting means for sorting and the effective frequency

7 spectrum calculated for capacitor in descending order, and  
8 making the sorted effective frequency spectrum the  
9 component order.

1 39. A Computer Aided Design apparatus according to Claim  
2 25, wherein

3 the pin order determining means determines the pin  
4 order using an order of shortness of one of a rising time  
5 and a falling time of a signal which is driven by a current  
6 which flows through the power pin, instead of the order  
7 of seriousness.

1 40. A Computer Aided Design apparatus according to Claim  
2 39, wherein

3 the second determining means determines the  
4 component order using an ascending order of equivalent  
5 series inductance of the passive components as the  
6 ascending order of impedance.

1 41. A Computer Aided Design apparatus according to Claim  
2 39, wherein

3 the second determining means determines the  
4 component order using a descending order of effective  
5 frequency spectrum as the ascending order of impedance,



6 the effective frequency spectrum being a frequency  
7 spectrum in which the impedance of a passive component is  
8 no greater than a threshold value.

1 42. A Computer Aided Design apparatus according to Claim  
2 39, wherein

3 the passive components are capacitors, and  
4 the second determining means determines the  
5 component order using an ascending order of the equivalent  
6 series inductance of the capacitors as the ascending order  
7 of impedance.

1 43. A Computer Aided Design apparatus according to Claim  
2 39, wherein

3 the passive components are capacitors, and  
4 the second determining means determines the  
5 component order using a descending order of effective  
6 frequency spectrum, the effective frequency spectrum being  
7 a frequency spectrum in which the impedance of a capacitor  
8 is no greater than a threshold value, instead of the  
9 ascending order of impedance.

1 44. A Computer Aided Design apparatus according to Claim  
2 25, wherein

3           the first determining means determines the pin order  
4   using an order of shortness of one of a rising time and  
5   a falling time of a signal which is driven by a current  
6   which flows through the power pin, instead of the order  
7   of seriousness.

1   45. A Computer Aided Design apparatus according to Claim  
2   44, wherein

3           the second determining means determines the  
4   component order using an ascending order of equivalent  
5   series inductance of the passive components as the  
6   ascending order of impedance.

1   46. A Computer Aided Design apparatus according to Claim  
2   44, wherein

3           the second determining means determines the  
4   component order using a descending order of effective  
5   frequency spectrum as the ascending order of impedance,  
6   the effective frequency spectrum being a frequency  
7   spectrum in which the impedance of a passive component is  
8   no greater than a threshold value.

1   47. A Computer Aided Design apparatus according to Claim  
2   44, wherein

3           the passive components are capacitors, and  
4           the determining means determines the component order  
5 using an ascending order of the equivalent series  
6 inductance of the capacitors as the ascending order of  
7 impedance.

1 48. A Computer Aided Design apparatus according to Claim  
2 44, wherein

3           the passive components are capacitors, and  
4           the second determining means determines the  
5 component order using a descending order of effective  
6 frequency spectrum, the effective frequency spectrum being  
7 a frequency spectrum in which the impedance of a capacitor  
8 is no greater than a threshold value, instead of the  
9 ascending order of impedance.

1 49. A Computer Aided Design apparatus according to Claim  
2 25, wherein

3           the first determining means determines the pin order  
4 using a descending order of an amount of consumed current  
5 of a signal which is driven by a current which flows through  
6 the power pin, as the order of seriousness.

1 50. A Computer Aided Design apparatus according to Claim

2 49, wherein

3 the second determining means determines the  
4 component order using an ascending order of equivalent  
5 series inductance of the passive components as the  
6 ascending order of impedance.

1 51. A Computer Aided Design apparatus according to Claim  
2 49, wherein

3 the second determining means determines the  
4 component order using a descending order of effective  
5 frequency spectrum as the ascending order of impedance,  
6 the effective frequency spectrum being a frequency  
7 spectrum in which the impedance of a passive component is  
8 no greater than a threshold value.

1 52. A Computer Aided Design apparatus according to Claim  
2 49, wherein

3 the passive components are capacitors, and  
4 the second determining means determines the  
5 component order using an ascending order of the equivalent  
6 series inductance of the capacitors as the ascending order  
7 of impedance.

1 53. A Computer Aided Design apparatus according to Claim

2 44, wherein

3 the passive components are capacitors, and

4 the second determining means determines the  
5 component order using a descending order of effective  
6 frequency spectrum, the effective frequency spectrum being  
7 a frequency spectrum in which the impedance of a capacitor  
8 is no greater than a threshold value, instead of the  
9 ascending order of impedance.

1 54. A Computer Aided Design apparatus according to Claim  
2 25, wherein

3 the first determining means calculates a voltage  
4 waveform of a signal which is driven by the current which  
5 flows through the power pin, based on a voltage, a frequency,  
6 a rising time, a falling time, and a duty ratio of the signal  
7 and sets the pin order using a descending order of a maximum  
8 frequency of a voltage that exceeds a voltage threshold  
9 in the voltage waveform, as the order of seriousness.

1 55. A Computer Aided Design apparatus according to Claim  
2 54, wherein

3 the second determining means determines the  
4 component order using an ascending order of equivalent  
5 series inductance of the passive components as the

6 ascending order of impedance.

1 56. A Computer Aided Design apparatus according to Claim  
2 54, wherein

3 the second determining means determines the  
4 component order using a descending order of effective  
5 frequency spectrum as the ascending order of impedance,  
6 the effective frequency spectrum being a frequency  
7 spectrum in which the impedance of a passive component is  
8 no greater than a threshold value.

1 57. A Computer Aided Design apparatus according to Claim  
2 54, wherein

3 the passive components are capacitors, and  
4 the second determining means determines the  
5 component order using an ascending order of the equivalent  
6 series inductance of the capacitors as the ascending order  
7 of impedance.

1 58. A Computer Aided Design apparatus according to Claim  
2 54, wherein

3 the passive components are capacitors, and  
4 the second determining means determines the  
5 component order using a descending order of effective

6 frequency spectrum, the effective frequency spectrum being  
7 a frequency spectrum in which the impedance of a capacitor  
8 is no greater than a threshold value, instead of the  
9 ascending order of impedance.

1 59. A Computer Aided Design apparatus according to Claim  
2 25, further comprising:

3 storage means for storing sets of net information,  
4 each set of net information showing a net made up of a  
5 plurality of pins to be connected,

6 dividing means for dividing, based one set of net  
7 information, a net whose power pins are to be connected  
8 into section nets, each section net corresponding to a  
9 component group made up of one first type component and  
10 at least one second type component assigned thereto,

11 selection means for selecting, for each section net,  
12 a power pin of a component whose impedance is highest, from  
13 amongst the second type components connected to the section  
14 net, as a representative pin; and

15 wiring means for wiring each section net  
16 independently, and for wiring so that a plurality of the  
17 representative pins are connected.

1 60. A Computer Aided Design apparatus for displaying at

2 least one component placement on a wiring board, and aiding  
3 an evaluation by a user of whether a placement of a position  
4 dependent component, whose effectiveness differs  
5 according to a placement position, is appropriate, the CAD  
6 apparatus comprising:

7 design information storage means for storing sets of  
8 position information which show the position of each  
9 component on the wiring board,

10 relationship information storage means for storing  
11 sets of relationship information of the placement  
12 dependent component in relation with an effected component  
13 which is effected by the placement dependent component;  
14 and

15 display means for displaying, according to one set  
16 of placement information, the position dependent component  
17 and the effected component which is in relation therewith  
18 in the relationship information in correspondence, in a  
19 user-recognizable state.

1 61. A Computer Aided Design apparatus according to Claim  
2 60, wherein

3 the display means displays the related position  
4 dependent component and the effected component in  
5 correspondence by linking the components by a line.



1 62. A Computer Aided Design apparatus according to Claim  
2 61, wherein

3 the display means links one of a pin of the position  
4 dependent component and a main body of the position  
5 dependent component with one of a pin of the effected  
6 component and a main body of the effected component, by  
7 a line.

1 63. A Computer Aided Design apparatus according to Claim  
2 61, wherein

3 the relationship information storage means further  
4 stores an effectiveness showing a degree of an effect, and

5 the display means further displays the effectiveness  
6 stored by the relationship information storage means in  
7 a user-recognizable state.

1 64. A Computer Aided Design apparatus according to Claim  
2 61 wherein

3 the display means links the related position  
4 dependent component and the effected component in a display  
5 state which differs according to a degree of effectiveness.

1 65. A Computer Aided Design apparatus according to Claim  
2 64, wherein

3       the display means distinguishes the degree of  
4 effectiveness by one of a line thickness, a line shape,  
5 a line color, a line shade, and a line pattern..

1   66. A Computer Aided Design apparatus according to Claim  
2   65, further comprising:

3       retrieval means for retrieving, based on the sets of  
4 position information stored by the position information  
5 storage means, the position dependent component and the  
6 effected component effected by the position dependent  
7 component; and

8       the relationship information storage means storing  
9 the retrieved position dependent component and the  
10 retrieved effected component in relation.

1   67. A Computer Aided Design apparatus according to Claim  
2   66, wherein

3       the retrieval means retrieves a position dependent  
4 component and an effected component which are within a  
5 predetermined distance of each other.

1   68. A Computer Aided Design apparatus according to Claim  
2   66, wherein

3       the retrieval means retrieves, for each position

4 dependent component, a predetermined number of effected  
5 components which are in a predetermined ascending order  
6 of closeness to the relevant effected component.

1 69. A Computer Aided Design apparatus for aiding an  
2 evaluation by a user of whether a placement of a position  
3 dependent component whose effectiveness differs according  
4 to a placement position is appropriate, comprising:

5 position information storage means for storing a set  
6 of position information which is made up of information  
7 showing a position on a wiring board of

8 (a) a position dependent component, or a pin thereof,  
9 and

10 (b) one or more effected components, or pins thereof,  
11 which are potentially effected by the position dependent  
12 component,

13 retrieval means for retrieving from the position  
14 dependent component or the pin thereof, based on the sets  
15 of position information stored by the position information  
16 storage means, for each effected component or the pins  
17 thereof, whether the effected component or a pin thereof  
18 is within a predetermined placement  
19 dependent component or the position for retrieving  
20 a predetermined number of its or pins

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21 thereof in a predetermined order; and

22 relationship information storage means for storing  
23 the effected component or the pin of the effected component  
24 retrieved by the retrieval means in relation with the  
25 position dependent component or the pin thereof from which  
26 the retrieval was performed, as relationship information.

1 70. A Computer Aided Design apparatus according to Claim  
2 69, wherein

3 the retrieval means further sets an effectiveness  
4 which shows a degree of effectiveness according to the  
5 distance or the order.

1 71. A Computer Aided Design apparatus according to Claim  
2 69, wherein

3 the position dependent component is a capacitor,  
4 the effected component is a switching element on  
5 which a noise elimination effect is potentially had by a  
6 capacitor, and

7 the retrieval means further retrieves within a range  
8 in which a capacity that is required by a switching element  
9 for noise reduction does not exceed a capacity of the  
10 capacitor.

1 72. A Computer Aided Design apparatus according to Claim  
2 71, wherein

3 the retrieval means further retrieves within a range  
4 in which a total value of capacities which a plurality of  
5 switching elements require for noise reduction does not  
6 exceed the capacity of the capacitor.

1 73. A Computer Aided Design apparatus according to Claim  
2 71, wherein

3 the retrieval means further retrieves within a range  
4 in which an amended value, which is a total value of  
5 capacities required by a plurality of switching elements  
6 for noise reduction multiplied by a ratio of the plurality  
7 of switching elements being switched simultaneously, does  
8 not exceed the capacity of the capacitor.

1 74. A Computer Aided Design apparatus according to Claim  
2 69, wherein

3 the retrieval means further retrieves only when a  
4 frequency characteristic of the position dependent  
5 component and a frequency characteristic of the effected  
6 component match.

1 75. A Computer Aided Design apparatus according to Claim

2 69, wherein

3 a distance used in the retrieval means is one of a  
4 straight line distance, a Manhattan distance, an actual  
5 wiring distance, and a path distance in which a loop area  
6 is a minimum.

1 76. A Computer Aided Design apparatus according to Claim  
2 69 further comprising:

3 extraction means for extracting, from amongst the  
4 effected components or the pins of the relevant effected  
5 components stored in the position information storage  
6 means, an effected component or a pin thereof that is not  
7 in relation with a position dependent component or a pin  
8 thereof in the sets of relationship information stored by  
9 the relationship information storage means; and

10 display means for displaying the effected component  
11 or the pin thereof extracted by the extraction means, in  
12 a user-recognizable state.

1 77. A Computer Aided Design apparatus according to Claim  
2 69 further comprising:

3 extraction means for extracting, from amongst the  
4 position dependent components or the pins of the relevant  
5 position dependent components stored in the position

6 information storage means, a position dependent component  
7 or a pin of an position dependent component that is not  
8 relation with an effected component or a pin of an effected  
9 component in the sets of relationship information stored  
10 by the relationship information storage means; and

11 display means for displaying the position dependent  
12 component or the pin of the position dependent component  
13 extracted by the extraction means, in a user-recognizable  
14 state.

1 78. A Computer Aided Design apparatus for aiding an  
2 evaluation by a user of whether a placement of a position  
3 dependent component whose effectiveness differs according  
4 to a placement position is appropriate, comprising:

5 position information storage means for storing a set  
6 of position information which is made up of information  
7 showing a position on a wiring board of .

8 (a) a position dependent component, or a pin thereof,  
9 and

10 (b) one or more effected components, or pins thereof,  
11 which are potentially effected by the position dependent  
12 component,

13 retrieval means for retrieving from the effected  
14 component or the pin thereof, based on the sets of position,

15 information stored by the position information storage  
16 means, for each position dependent component or the pins  
17 thereof, whether the position dependent component or the  
18 pin thereof is within a predetermined distance from the  
19 effected component or the pin thereof, or for retrieving  
20 a predetermined number of position dependent components  
21 or pins thereof in a predetermined order; and  
22 relationship information storage means for storing  
23 the position dependent component or the pin of the position  
24 dependent component retrieved by the retrieval means in  
25 relation with the effected component or the pin thereof  
26 from which the retrieval was performed, as relationship  
27 information.

1 79. A Computer Aided Design apparatus according to Claim  
2 78, wherein

3 the retrieval means further sets an effectiveness  
4 which shows a degree of effectiveness according to the  
5 distance or the order.

1 80. A Computer Aided Design apparatus according to Claim  
2 78, wherein

3 the position dependent component is a capacitor,  
4 the effected component is a switching element on



5 which a noise elimination effect is potentially had by a  
6 capacitor, and  
7 the retrieval means further retrieves within a range  
8 in which a capacity that is required by a switching element  
9 for noise reduction does not exceed a capacity of the  
10 capacitor.

1 81. A Computer Aided Design apparatus according to Claim  
2 80, wherein

3 the retrieval means further retrieves within a range  
4 in which a total value of capacities which a plurality of  
5 switching elements require for noise reduction does not  
6 exceed the capacity of the capacitor.

1 82. A Computer Aided Design apparatus according to Claim  
2 80, wherein

3 the retrieval means further retrieves within a range  
4 in which an amended value, which is a total value of  
5 capacities required by a plurality of switching elements  
6 for noise reduction multiplied by a ratio of the plurality  
7 of switching elements being switched simultaneously, does  
8 not exceed the capacity of the capacitor.

1 83. A Computer Aided Design apparatus according to Claim

2 78, wherein

3 the retrieval means further retrieves only when a  
4 frequency characteristic of the position dependent  
5 component and a frequency characteristic of the effected  
6 component match.

1 84. A Computer Aided Design apparatus according to Claim  
2 78, wherein

3 a distance used in the retrieval means is one of a  
4 straight line distance, a Manhattan distance, an actual  
5 wiring distance, and a path distance in which a loop area  
6 is a minimum.

1 85. A Computer Aided Design apparatus according to Claim  
2 78, further comprising:

3 extraction means for extracting, from amongst the  
4 effected components or the pins of the relevant effected  
5 components stored in the position information storage  
6 means, an effected component or a pin thereof that is not  
7 in relation with a position dependent component or a pin  
8 thereof in the sets of relationship information stored by  
9 the relationship information storage means; and

10 display means for displaying the effected component  
11 or the pin thereof extracted by the extraction means, in

12 a user-recognizable state.

1 86. A Computer Aided Design apparatus according to Claim  
2 78, further comprising:

3 extraction means for extracting, from amongst the  
4 position dependent components or the pins of the relevant  
5 position dependent components stored in the position  
6 information storage means, a position dependent component  
7 or a pin of an position dependent component that is not  
8 relation with an effected component or a pin of an effected  
9 component in the sets of relationship information stored  
10 by the relationship information storage means; and

11 display means for displaying the position dependent  
12 component or the pin of the position dependent component  
13 extracted by the extraction means, in a user-recognizable  
14 state.

1 87. A computer program embodied on a computer readable  
2 medium for use with a computer for aiding a design of a  
3 printed wiring board, the program realizing on the  
4 computer:

5 determining means for determining a component order  
6 in an ascending order of impedance of passive components  
7 amongst components to be placed on the printed wiring

8 board; and  
9 placement means for placing the passive components  
10 in the determined component order.

1 88. A computer program according to Claim 87, wherein  
2 the placement means places each of the passive  
3 components in a vicinity of a power pin of a non-passive  
4 component which is already placed.

1 89. A computer program according to Claim 87, wherein the  
2 program further realizes on the computer:

3 pin order determining means for setting a pin order  
4 for each power pin of non-passive components in order of  
5 seriousness of noise that can occur in a current that flows  
6 through the power pin; and

7 assigning means for assigning each passive component  
8 to a component which has a power pin, in descending pin  
9 order and descending component order,

10 the placement means placing each passive component  
11 in a vicinity of the power pin of the component to which  
12 the passive component is assigned, in the descending order  
13 of component order.

1 90. A computer program embodied on a computer readable

2 medium for use with a computer for aiding a design of a  
3 printed wiring board for placing a component belonging to  
4 a second type of components in a vicinity of a component  
5 belonging to a first type of component, on the printed  
6 wiring board, the program realizing on the computer:

7 first determining means for determining a pin order  
8 in order of seriousness of noise that can occur in a current  
9 that flows through a power pin, for a power pin of each  
10 of the components belonging to the first type of  
11 components,

12 second determining means for determining a component  
13 order in ascending order of impedance for each component  
14 belonging to the second type of components; and

15 assigning means for assigning a second type component  
16 which is highest amongst the components in the component  
17 order that are not assigned, to a first type component  
18 having a power pin which is highest amongst the power pins  
19 in the pin priority that are not assigned.

1 91. A component placement evaluation aiding computer  
2 program embodied on a computer readable medium for  
3 displaying a placement of components that are on a wiring  
4 board and aiding an evaluation by a user of whether a  
5 placement of a position dependent component whose

6 effectiveness differs according to a placement position  
7 is appropriate, the program realizing on a computer:  
8       a position information storage step for storing a set  
9 of position information which is made up of information  
10 showing a position on a wiring board of  
11       (a) a position dependent component, or a pin thereof,  
12 and  
13       (b) one or more effected components, or pins thereof,  
14 which are potentially effected by the position dependent  
15 component,  
16       a retrieval step for retrieving from the position  
17 dependent component or the pin thereof, based on the sets  
18 of position information stored in the position information  
19 storage step, for each effected component or the pins  
20 thereof, whether the effected component or the pin thereof  
21 is within a predetermined distance from the placement  
22 dependent component or the pin thereof; or for retrieving  
23 a predetermined number of effected components or pins  
24 thereof in a predetermined order; and  
25       a relationship information storage step for storing  
26 the effected component or the pin of the effected component  
27 retrieved in the retrieval step in relation with the  
28 position dependent component or the pin thereof from which  
29 the retrieval was performed, as relationship information.

1 92. A component placement evaluation aiding computer  
2 program embodied on a computer readable medium for aiding  
3 an evaluation by a user of whether a placement of a position  
4 dependent component whose effectiveness differs according  
5 to a placement position is appropriate, the program  
6 realizing on a computer:

7 a position information storage step for storing a set  
8 of position information which is made up of information  
9 showing a position on a wiring board of

10 (a) a position dependent component, or a pin thereof,  
11 and

12 (b) one or more effected components, or pins thereof,  
13 which are potentially effected by the position dependent  
14 component,

15 a retrieval step for retrieving from the position  
16 dependent component or the pin thereof, based on the sets  
17 of position information stored in the position information  
18 storage step, for each effected component or the pins  
19 thereof, whether the effected component or the pin thereof  
20 is within a predetermined distance from the placement  
21 dependent component or the pin thereof, or for retrieving  
22 a predetermined number of effected components or pins  
23 thereof in a predetermined order; and

24 a relationship information storage step for storing

25 the effected component or the pin of the effected component  
26 retrieved in the retrieval step in relation with the  
27 position dependent component or the pin thereof from which  
28 the retrieval was performed, as relationship information.

1 93. A component placement evaluation aiding computer  
2 program embodied on a computer readable medium for aiding  
3 an evaluation by a user of whether a placement of a position  
4 dependent component whose effectiveness differs according  
5 to a placement position is appropriate, the program  
6 realizing on a computer:

7 a position information storage step for storing a set  
8 of position information which is made up of information  
9 showing a position on a wiring board of

10 (a) a position dependent component, or a pin thereof,  
11 and

12 (b) one or more effected components, or pins thereof,  
13 which are potentially effected by the position dependent  
14 component,

15 a retrieval step for retrieving from the effected  
16 component or the pin thereof, based on the sets of position  
17 information stored in the position information storage  
18 step, for each position dependent component or the pins  
19 thereof, whether the position dependent component or the



20 pin thereof is within a predetermined distance from the  
21 effected component or the pin thereof, or for retrieving  
22 a predetermined number of position dependent components  
23 or pins thereof in a predetermined order; and

24 a relationship information storage step for storing  
25 the position dependent component or the pin of the position  
26 dependent component retrieved in the retrieval step in  
27 relation with the effected component or the pin thereof  
28 from which the retrieval was performed, as relationship  
29 information.

1 94. A program implemented on a computer for aiding a design  
2 of a printed wiring board, the program realizing on the  
3 computer:

4 determining means for determining a component order  
5 in an ascending order of impedance of passive components  
6 amongst components to be placed on the printed wiring  
7 board; and

8 placement means for placing the passive components  
9 in the determined component order.

1 95. A program according to Claim 94, wherein

2 the placement means places each of the passive  
3 components in a vicinity of a power pin of a non-passive

4 component which is already placed.

1 96. A program according to Claim 94, further realizing on  
2 a computer:

3 pin order determining means for setting a pin order  
4 for each power pin of non-passive components in order of  
5 seriousness of noise that can occur in a current that flows  
6 through the power pin; and

7 assigning means for assigning each passive component  
8 to a component which has a power pin, in descending pin  
9 order and descending component order,

10 the placement means placing each passive component  
11 in a vicinity of the power pin of the component to which  
12 the passive component is assigned, in the descending order  
13 of component order.

1 97. A program implemented on a computer for aiding a design  
2 of a printed wiring board for placing a component belonging  
3 to a second type of components in a vicinity of a component  
4 belonging to a first type of component, on the printed  
5 wiring board, the program realizing on the computer:

6 first determining means for determining a pin order  
7 in order of seriousness of noise that can occur in a current  
8 that flows through a power pin, for a power pin of each

9 of the components belonging to the first type of  
10 components,

11 second determining means for determining a component  
12 order in ascending order of impedance for each component  
13 belonging to the second type of components; and

14 assigning means for assigning a second type component  
15 which is highest amongst the components in the component  
16 order that are not assigned, to a first type component  
17 having a power pin which is highest amongst the power pins  
18 in the pin priority that are not assigned.

1 98. A program implemented on a computer for aiding an  
2 evaluation by a user of whether a placement of a position  
3 dependent component whose effectiveness differs according  
4 to a placement position is appropriate by displaying a  
5 placement of components on a wiring board, the program  
6 realizing on a computer:

7 a design information storage step for storing a set  
8 of position information which is made up of (a) information  
9 showing a position on a wiring board of a position dependent  
10 component, or a pin thereof, and

11 (b) information showing one or more effected  
12 components, or pins thereof, which are potentially  
13 effected by the position dependent component, and

14           a relationship information storage means for storing  
15   in correspondence relationship information about the  
16   position dependant component or the pin thereof and the  
17   placement dependent component or the pin thereof within  
18   a predetermined distance from the placement dependent  
19   component or the pin thereof; and

20           a display step for displaying the position dependant  
21   component or the pin thereof and the effected component  
22   or the pin thereof in correspondence in the relationship  
23   information stored in the relationship information storage  
24   step, in a user-recognizable state.

1   99. A program implemented on a computer for aiding an  
2   evaluation by a user of whether a placement of a position  
3   dependent component whose effectiveness differs according  
4   to a placement position is appropriate, the program  
5   realizing on a computer:

6           a position information storage step for storing a set  
7   of position information which is made up of information  
8   showing a position on a wiring board of

9           (a) a position dependent component, or a pin thereof,  
10   and

11           (b) one or more effected components, or pins thereof,  
12   which are potentially effected by the position dependent

13 component,

14 a retrieval step for retrieving from the position  
15 dependent component or the pin thereof, based on the sets  
16 of position information stored in the position information  
17 storage step, for each effected component or the pins  
18 thereof, whether the effected component or the pin thereof  
19 is within a predetermined distance from the placement  
20 dependent component or the pin thereof, or for retrieving  
21 a predetermined number of effected components or pins  
22 thereof in a predetermined order; and

23 a relationship information storage step for storing  
24 the effected component or the pin of the effected component  
25 retrieved in the retrieval step in relation with the  
26 position dependent component or the pin thereof from which  
27 the retrieval was performed, as relationship information.

1 100. A program implemented on a computer for aiding an  
2 evaluation by a user of whether a placement of a position  
3 dependent component whose effectiveness differs according  
4 to a placement position is appropriate, the program  
5 realizing on a computer:

6 a position information storage step for storing a set  
7 of position information which is made up of information  
8 showing a position on a wiring board of

9           (a) a position dependent component, or a pin thereof,  
10 and  
11           (b) one or more effected components, or pins thereof,  
12 which are potentially effected by the position dependent  
13 component,  
14           a retrieval step for retrieving from the effected  
15 component or the pin thereof, based on the sets of position  
16 information stored in the position information storage  
17 step, for each position dependent component or the pins  
18 thereof, whether the position dependent component or the  
19 pin thereof is within a predetermined distance from the  
20 effected component or the pin thereof, or for retrieving  
21 a predetermined number of position dependent components  
22 or pins thereof in a predetermined order; and  
23           a relationship information storage step for storing  
24 the position dependent component or the pin of the position  
25 dependent component retrieved in the retrieval step in  
26 relation with the effected component or the pin thereof  
27 from which the retrieval was performed, as relationship  
28 information.